

water from the colony. The other zooids draw in water from the exterior by the action of the cilia which line their cavities. This is true also of the sexual polyps in their early stages (though this function is entirely lost as they become older). Hence the zooids are physiologically, as well as anatomically, identical with the young polyps; they are, in other words, polyps in a state of arrested development.

The taking in of water is of vital importance to the organism, since the movements of the peduncle, by which the creature creeps, are effected by forcing the water to and fro. In this fact we find, probably, the explanation of the very early appearance of buds upon the axial polyp.

IV.

(20.) The facts of development, so far as they go, indicate the derivation of *Renilla* from a form related to the Bathypileæ, which probably possessed a horny axis. This view is opposed to that of Kölliker, who considers that *Renilla* is related to the Penniformes only through a primitive simple "*Archiptilum*."

(21.) The following section contains a brief discussion of the bilateral symmetry, which is strongly exhibited, both in the individual polyps and in the entire colony. It is shown that in both cases the bilateral structure is correlated with a bilateral environment, which indicates a causal relation between the two; and I conclude that the bilateral environment determines the bilateral structure.

(22.) The last section contains a discussion of the polymorphism of *Renilla*. An attempt is made to show that the zooids are probably not degenerated polyps but buds in a state of arrested development, whose direct ancestors never possessed a more highly organised structure than at present.

Other theoretical questions suggested by the investigation are discussed under the various sections in the body of the paper.

II. "On the Morphology and the Development of the Perithecium of *Meliola*, a Genus of Tropical Epiphyllous Fungi."
By H. MARSHALL WARD, B.A., Fellow of Owens College, Victoria University; late Cryptogamist to the Ceylon Government. Communicated by W. T. THISELTON DYER, F.R.S. Received November 28, 1882.

(Abstract.)

The author has investigated the life-history, structure, and development of several species of these remarkable epiphytic fungi. The

much branched mycelium consists of jointed cylindrical hyphæ, with hardened brown or black cell-walls and finely granular protoplasmic contents; these are closely attached to the epidermis of tropical plants by rudimentary *haustoria*, which are closely adherent to the cuticle, but do not pierce the cells of the host.

The mycelium supports setaceous appendages of various forms, simple or branched; these *setæ* spring from scattered points along the course of the hyphæ, and are especially developed from around the fruit-bodies, arising from richly branched hyphæ in their neighbourhood. Bornet considered these as forming a special part of the fungus, under the name of the "receptacle," but development teaches that they cannot be regarded as of importance; no special function can be assigned to the *setæ*, and they are certainly not tubes for the outlet of the *spores*, as earlier observers surmised.

Other appendages occur as short, lateral, pyriform, or flasked-shaped branchlets; some of which become free, and develop new *mycelia* by budding, much as is the case with the *conidia* of *Erysiphe* and allied fungi. Others give rise to the *Perithecia*, which are globular or sub-globular cases containing *asci* in their interior, and with hard black outer cell-walls.

The author has studied the origin and development of the *Perithecium* very particularly. A short ovoid or pyriform lateral branchlet becomes cut off as a unicellular body, by a firm septum close to the parent hypha; this cell is next divided into two by a cell-wall passing obliquely across it. Of the two cells thus produced, one divides more slowly, and forms a mass or "core" of thin-walled cells, with richly developed protoplasmic contents; the other, dividing much more rapidly, produces a layer of cells, which gradually envelopes the "core" of thin-walled cells, and forms the outer walls of the *Perithecium*.

The "core" of more slowly dividing thin-walled cells is an *asconium*; in later stages, certain of its constituents are seen to form the *asci* and *spores*, while others deliquesce and serve as nutritive material. The outer walls of the enveloping layers become thick, hard, and dark-coloured; the inner cells of the series deliquesce, and serve for nutrition of the young *asci*, &c., as before. All these processes are recognised in vertical sections of the young *Perithecium* in various stages, and are figured and described in detail.

The *asci* are delicate clavate sacs, developed successively, and containing two to eight uni-tri-septate *spores*, the formation of which is also figured. The germination of the *spores* was also examined; each puts forth a germinal tube, which soon develops a rudimentary *haustorium*, and becomes irregularly branched, finally growing forth as a *mycelium* like that first described.

The author examines and criticises the views held by Fries and

Bornet (who only worked with dried specimens), especially as to the systematic position of *Meliola*, and the opinion that they are representative tropical species of the European *Erysipheæ*. He shows that the original cell, from which the *Perithecium* is developed by continuous cell-multiplication, must be regarded as containing in itself the undifferentiated elements of an *Archecarpium* and *Antheridium-branch* (in the sense of De Bary and others); and that after the primary division into two unequal cells, we must look upon one of these—the more slowly divided *ascogenous* cell—as an *Archecarpium*, which produces the *asci* and *spores*, &c., while the other more rapidly developing cell may be considered the equivalent of the *Antheridium* and enveloping tissues of such a fruit-body as that of *Erysiphe*. Thus the sexual process, reduced to a minimum (physiologically) in *Erysipheæ*, has here disappeared entirely, the morphological equivalents of sexual organs being also further withdrawn. One step further, and we arrive at forms in which no trace of sexual organs exist. The *Meliolas* must therefore be regarded as a group, developed along similar lines to those of the *Erysipheæ*, *Eurotium*, &c., but in which the sexual process has become suppressed to a still greater extent.

With respect to the pathological action of these fungi on their hosts, the investigations show that no direct parasitic action of the *mycelium* is recognisable; the rudimentary *haustoria* do not injure the cell-contents, nor even pierce the cell-walls. Injury results indirectly, however, because the well developed *mycelium* deprives the leaves of light, air, &c., and blocks up the *stomata*.

III. "Note on a Discovery, as yet unpublished, by the late Professor F. M. Balfour, concerning the Existence of a Blastopore, and on the Origin of the Mesoblast in the Embryo of *Peripatus Capensis*." By Professor MOSELEY, F.R.S., and ADAM SEDGWICK, M.A., Fellow of Trinity College, Cambridge. Received December 4, 1882.

The late Professor F. M. Balfour left a considerable amount of material, both in the form of drawings and MSS., which he had intended to employ in the publication of a monograph on the anatomy and development of the members of the genus *Peripatus*, together with an account of all known species. The portions relating to anatomy and development have been prepared for the press, and will in the course of some months appear in the "Quarterly Journal of Microscopical Science" in full; but as some of the embryological results are of especial interest and of general morphological importance, it